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Additions to rust and chytrid pathogens of Turkey

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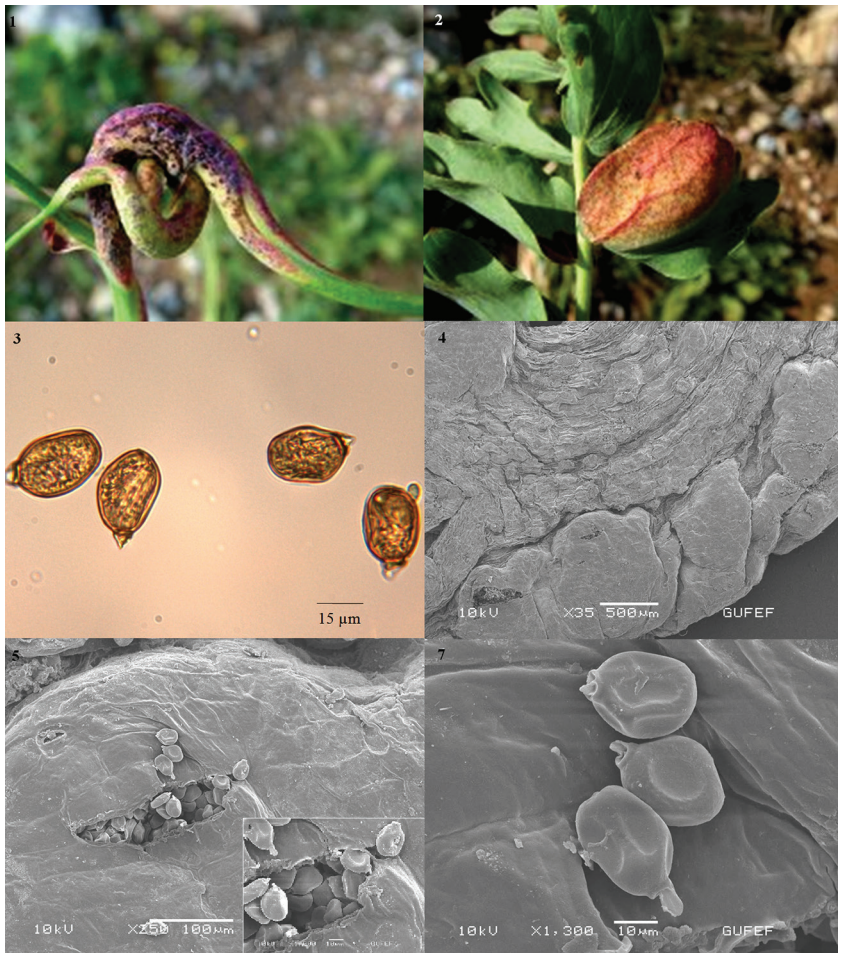
Abstract — *Uromyces bornmuelleri* on *Bongardia chrysogonum* and *Physoderma maculare* on *Alisma plantago-aquatica* have been recently discovered in Turkey. Morphological data obtained by light and scanning electron microscopy of identified fungi are presented.

Key words — new records, *Chytridiomycota*, *Basidiomycota*

Introduction

The *Pucciniaceae* are the largest family within the *Uredinales*, parasitising almost all major angiosperm orders, with some primarily herbaceous plant families such as *Asteraceae* and *Poaceae* being most commonly infected (van der Merwe et al. 2007). *Uromyces* (Link) Unger was raised to generic rank by Unger (1832), and is typified by *U. appendiculatus* on *Phaseolus*. Seventy-four species of *Uromyces* have been registered on 227 species of higher plants in Turkey (Bahçecioğlu & Kabaktepe 2012).

All known representatives of the genus *Physoderma* Wallr. (*Blastocladiomycetes*, *Physodermataceae*) are obligate parasites of vascular plants (Olson et al. 1980). The generalized life cycle of *Physoderma* is composed of two distinct and separate phases, and the ephemeral epibiotic sporangium with an endobiotic rhizoidal system is confined to a single host cell (Sparrow & Johns 1965). *Physoderma maculare,* the type species of the genus, on *Alisma* confirms Clinton's (1902) account of the epibiotic stage being produced from resting zoospores. The latter on mature host tissue may also give rise to the endobiotic stage, which bears resting spores. On seedlings, however, resting zoospores produce only epibiotic sporangia (Sparrow 1964).



Figs 1–7. *Uromyces bornmuelleri.* 1: Deformation of host plant. 2: Telia on leaf, in situ. 3: Teliospores. 4–6: Telia and teliospores (SEM). 7. Teliospores (SEM).

Materials & methods

Plant specimens infected with microfungi were collected from Adıyaman and Siirt provinces, Turkey and prepared according to established herbarium techniques. Host plants were identified using the Flora of Turkey and East Aegean Islands (Davis 1965–85). The fungal specimens were prepared from the host plants by obtaining thin sections. Measurements were made from tissues mounted in 5% KOH or tap water. Microscopical features were examined and microphotographs were made using a Leica

DM E light microscope. Thirty spores were measured for each sample. The microfungi were identified using relevant literature (De Toni 1888, Saccardo & Sydow 1902, Gonzalez Fragoso 1918, Kuprevich & Ulijanishchev 1975, van der Merwe et al. 2007). Species names follow Index Fungorum (2014). The examined specimens have been deposited in the mycological collection of the Department of Plant Protection, Faculty of Agriculture, Dicle University, Diyarbakır, Turkey (DUF-M).

For scanning electron microscopy (SEM), 8–10 mm squares of infected leaves were mounted on SEM stubs with double-sided adhesive tape, coated with gold using a Polaron SC 502 Sputter Coater, and examined with a Jeol JSM 6060 scanning electron microscope at 5–10 kV in the Electron Microscopy Unit, Faculty of Science, Gazi University (Turkey).

Taxonomy

Uromyces bornmuelleri Magnus, Verh. Ges. Deutsch. Naturf. 65: 151.1893. Figs 1–7

Spermogonia, aecidia and uredinia unknown. Telia amphigenous, chestnut brown, in dense groups or scattered, 0.2–3 mm diam., causing leaf deformation, at first covered by the epidermis, later becoming erumpent, pulverulent. Teliospores yellow or yellowish-brown, ovoid, globoid, sometimes oblong, 21–30 × 18–21.5 µm, rounded at the apex, rounded or sometimes attenuate at the base; wall 2–4 µm thick, pedicels hyaline, short, fragile.

Specimen examined — **TURKEY, Adıyaman Province**, Center, Kahta, Gerger, Sincik, Çelikhan, Samsat, in wheat field ecosystem, on the leaves of *Bongardia chrysogonum* (L.) Spach (*Berberidaceae*), 12.V.2009, C. Özaslan CÖ2029 (DUF-M).

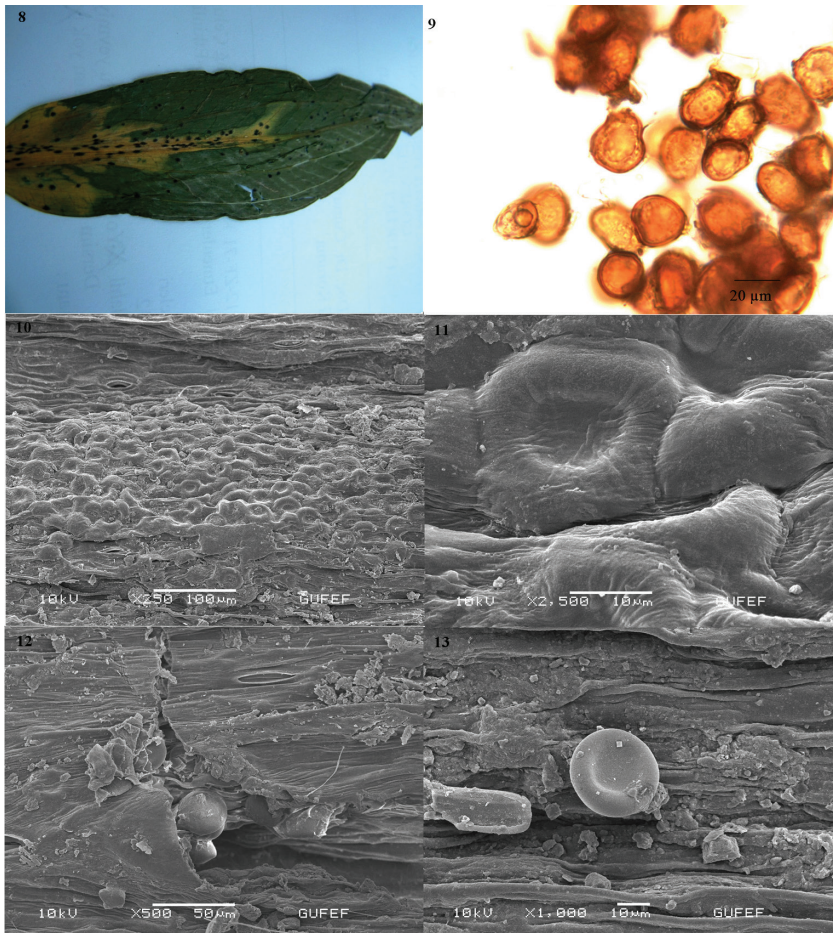
Uromyces bornmuelleri has been reported from Azerbaijan on *Leontice chrysogonum* [≡ *Bongardia chrysogonum*] (Tranzschel 1939), and from Iraq and Cyprus on *Bongardia chrysogonum* (Georghiou 1957, Mathur 1972). *Uromyces bornmuelleri* is reported for the first time from Turkey.

Physoderma maculare Wallr., Fl. Crypt. Germ. 2: 192. 1833. Figs 8–13

Resting sporangia amphigenous, mostly hypophyllous and on leaf petioles, concentrated on leaves along the nerves, scattered, covered by the unbroken epidermis, ellipsoid, ovoid, sometimes punctiformis, 1–2 mm diam., chestnut brown. Resting spores chestnut brown, globoid, ovoid to ellipsoid, content granular with more refractive globules, (23.5–)25.5–32 × 21.5–29 µm; with two distinct walls, the inner wall thin and colorless, the outer wall chestnut brown, 1–2 µm thick, smooth. Zoospores not seen.

Specimen examined — **TURKEY, Siirt Province**, Karaca Village, 38°07 09 N 42°01 59 E, in rice field ecosystem, on the leaves of *Alisma plantago-aquatica* L. (*Alismataceae*), 8.VI.2012, C. Özaslan CÖ2035 (DUF-M).

The genus *Physoderma* and *P. maculare* are reported for the first time from Turkey. This fungus has been reported from Canada (Conners 1967), Ireland



Figs 8–13. *Physoderma maculare*. 8: Resting sporangia on leaf, in situ. 9: Resting spores. 10: Resting sporangia on leaf (SEM). 11–13: Resting spores (SEM).

(Muskett & Malone 1984, as *Cladochytrium alismatis*), Poland (Czeczuga et al. 2007), Siberia (De Toni 1888, as *Uredo alismatis*), Spain (Gonzalez Fragoso 1918, as *U. alismatis*), and U.S.A. (Farr et al. 1989).

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